WHAT IS CLAIMED IS:

1. A motor control system for controlling a brushless and sensorless DC motor system having a plurality of phase coils, comprising:

a motor control integrated circuit having a plurality of motor driver outputs and a control input for operating said plurality of output drivers, said plurality of motor driver outputs coupled to the plurality of phase coils; and

a fault detection circuit coupled with said control input and capable of selectively switching the state of said control signal to momentarily disable said plurality of output drivers, said fault detection circuit being coupled to at least one of the plurality of phase coils and is capable of detecting a threshold back EMF voltage from the at least one of the plurality of phase coils.

2. The motor control system of claim 1, wherein said fault detection circuit includes a capacitor coupled to the at least one of the plurality of phase coils, said capacitor receiving back EMF and said fault detection circuit detecting said threshold back EMF voltage across said capacitor.

3. The motor control system of claim 2, wherein said fault detection circuit includes at least one optical isolator coupling the at least one of the plurality of phase coils and said capacitor.

4. The motor control system of claim 1, wherein said fault detection circuit includes a microcontroller having an analog-to-digital converter coupled to the at least one of the plurality of phase coils and an output port coupled to said control input.

5. The motor control system of claim 4, further comprising at least one optically coupled isolator coupling said analog-to-digital converter and the at least one of the plurality of phase coils.

6. The motor control system of claim 4, further comprising software enabling said microcontroller to:

switch said control signal coupled to said control input, momentarily disabling said plurality of motor driver outputs;

measure back EMF generated by the at least one of the plurality of phase coils and received by said analog-to-digital converter; and

switch said control signal coupled to said control input upon measuring back EMF above a threshold level, enabling said plurality of motor driver outputs.

7. The motor control system of claim 6, wherein said software further enables said microcontroller to delay switching said control signal for a preset time upon measuring back EMF below a threshold level in order to delay re-enabling said plurality of motor driver outputs.

8. The motor control system of claim 7, wherein said microcontroller is capable of providing a fault signal and said software further enables said microcontroller to switch said control signal to disable said plurality of motor driver outputs, and to provide said fault signal upon measuring a back EMF below a threshold level more than a preset number of times.

9. A motor control system for controlling a brushless and sensorless DC motor system having a plurality of phase coils, comprising:

a motor control integrated circuit having a plurality of motor driver outputs and a control input for operating said plurality of output drivers, said plurality of motor driver outputs coupled to the plurality of phase coils; and

a fault detection circuit coupled with said control input and capable of detecting a plurality of electrical and nonelectrical fault conditions of the motor system, said fault detection circuit capable of providing a control signal to said control input to disable said plurality of output drivers upon detection of at least one of said plurality of electrical and nonelectrical fault conditions.

10. The motor control system of claim 9, further comprising a temperature sensing circuit coupled to said fault detection circuit.

11. The motor control system of claim 10, further comprising a motor housing and a temperature sensor thermally coupled to said motor housing and electrically coupled to said temperature sensing circuit.

12. The motor control system of claim 10, further comprising a temperature sensor and a compressor driven by said motor and having a housing, said temperature sensor thermally coupled to said housing and electrically coupled to said temperature sensing circuit.

13. The motor control system of claim 10, further comprising:

a transistor power bridge circuit coupled between said plurality of motor driver outputs and the plurality of phase coils;

a heat sink thermally coupled to said transistor power bridge circuit; and

a power bridge temperature sensor thermally coupled to said heat sink and electrically coupled to said temperature sensing circuit.

14. The motor control system of claim 9, further comprising a voltage sensing circuit coupled to a voltage supply of the system, said voltage sensing circuit coupled to said fault detection circuit, said fault detection circuit capable of switching said control input to disable said plurality of motor driver outputs upon said voltage supply being above or below a preset limit.

15. The motor control system of claim 9, further comprising a current sensing circuit coupled to at least one of the plurality of phase coils, said current sensing circuit coupled to said fault detection circuit, said fault detection circuit capable of switching said control input to disable said plurality of motor drivers upon a detected phase coil current being above or below a preset limit.

16. The motor control system of claim 9, wherein said motor control integrated circuit outputs a speed signal related to motor speed, and said fault detection circuit is capable of receiving said speed signal and switching said control input to disable said plurality of motor drivers upon said motor speed being above or below a preset motor speed limit.

17. The motor control system of claim 9, wherein said control input is an over current protection input of said motor control integrated circuit.

18. A method for detecting faults in a motor control system for a brushless and sensorless DC motor system having a plurality of phase coils, comprising the steps of:

providing a motor control integrated circuit having a plurality of power drivers coupled to the plurality of phase coils, and having a control input capable of selectively enabling the plurality of power drivers;

detecting a motor system fault by measuring EMF on at least one of the plurality of phase coils; and

switching the control input to disable the plurality of power drivers upon detecting a motor system fault indicated by excess, measured EMF below a present threshold, thereby stopping motor operation.

19. The method of claim 18, wherein the step of detecting a motor system fault includes the further steps of:

switching the control input to momentarily disable the plurality of power drivers;

then measuring the back EMF generated in the plurality of phase coils; and

then switching the control input to enable the plurality of output drivers.

20. The method of claim 18, wherein the step of detecting a motor system fault includes the steps of:

measuring the temperature of a portion of the motor system; and

determining a fault upon the measured temperature exceeding a preset threshold.

21. The method of claim 18, wherein the step of detecting a motor system fault includes the steps of:

measuring the supply voltage of the motor; and

determining a fault upon the measured supply voltage being above or below a preset voltage threshold.

22. The method of claim 18, wherein the step of detecting a motor system fault includes the steps of:

measuring the supply current for at least one of the plurality of phase coils; and

determining a fault upon the measured supply current being above or below a preset current threshold.

23. The method of claim 18, wherein the motor system includes a compressor driven by the motor, and wherein the step of detecting a motor system fault includes the steps of:

determining a minimum motor speed below which the compressor may be damaged due to lack of adequate lubrication;

measuring the motor speed; and

determining a fault upon the measured motor speed being above or below the minimum motor speed.

24. The method of claim 18, wherein the motor system includes a compressor driven by the motor, and wherein the step of determining a motor system fault includes the steps of:

determining a maximum motor speed above which compressor valve damage may occur;

measuring the motor speed; and

determining a fault upon the measured motor speed exceeding the maximum motor speed.

25. A method for detecting a locked or stopped rotor in a motor control system for a brushless and sensorless DC motor system having a plurality of phase coils driven by power drivers, comprising the steps of:

disabling the power drivers;

then measuring the back EMF generated from the plurality of phase coils; and

then enabling the power drivers after a time period dependent on the measured back EMF.

26. The method of claim 25, further comprising the following steps after the step of then measuring the back EMF:

if measured back EMF is above a preset threshold, setting the time period to zero.

27. The method of claim 26, further comprising the steps of:

incrementing a counter each time measured back EMF is below the preset threshold; and

upon the counter exceeding a preset limit, disabling the power drivers.

28. The method of claim 25, further comprising the steps of:

measuring the temperature of a portion of the motor system; and

upon the measured temperature exceeding a threshold, disabling the power drivers.

29. The method of claim 25, further comprising the steps of:

measuring a motor supply voltage; and

upon the measured voltage being above or below a preset range, disabling the power drivers.

30. The method of claim 25, further comprising the steps of:

measuring a motor supply current supplied to at least one of the plurality of phase coils, and

upon the measured current being above or below a preset range, disabling the power drivers to the plurality of phase coils.

31. The method of claim 25, wherein the motor system includes a compressor driven by the motor, and further comprising the steps of:

determining a minimum motor speed below which the compressor may be damaged due to lack of adequate lubrication;

determining the motor speed; and

upon the motor speed being below the minimum motor speed, disabling the power drivers.

32. The method of claim 25, wherein the motor system includes a compressor having valves and driven by the motor, and further comprising the steps of:

determining a maximum motor speed above which the valves may be damaged;

measuring the motor speed; and

upon the motor speed exceeding the maximum motor speed, disabling the power drivers.

33. A fluid handling system, comprising:

a pump;

a brushless DC motor for driving said pump, said motor having a plurality of phase coils; and

a motor control system coupled to said motor, said motor controller system including:

a motor control circuit having at least one motor driver output coupled to said plurality of phase coils; and

a microcontroller having an A/D converter coupled to at least one of said plurality of phase coils and having software enabling said microcontroller to provide an output signal coupled to said motor control circuit for momentarily disabling said at least one motor driver output, said microcontroller capable of measuring a voltage level of back EMF generated in said at least one of said plurality of phase coils upon said at least one motor driver output being disabled.

34. The fluid handling system of claim 33, wherein said pump includes a compressor.

35. The fluid handling system of claim 33, wherein said software enables said microcontroller to provide said output signal to keep said at least one motor driver output disabled upon said voltage level being below a preset limit.

36. An actuator control system for controlling a sensorless DC actuator having a coil, comprising:

an actuator control integrated circuit having a control input and an output driver, said control input adapted for selectively disabling said output driver, said output driver coupled to the coil; and

a voltage measuring circuit coupled with the coil and providing a control signal coupled with said control input;

said voltage measuring circuit measuring a voltage received from the coil upon said voltage measuring circuit momentarily providing said control signal;

said voltage measuring circuit further providing said control signal upon said received voltage being below a preset threshold.

37. The actuator control system of claim 36, wherein the actuator includes a brushless DC motor and the actuator control integrated circuit is adapted for brushless DC motor control.

38. The actuator control system of claim 37, wherein said voltage measuring circuit includes a microcontroller.

39. The actuator control system of claim 37, wherein said voltage measuring circuit includes a capacitor coupled to the coil and said received voltage is measured across said capacitor.